



# SIZING UP PARTICULATE MATTERS

## OCCUPATIONAL VS ENVIRONMENTAL CRITERIA

Occupational and environmental health professionals both assess the hazards of particulate matter (PM) on exposed individuals. But the criteria and methods used to measure and evaluate airborne levels of PM are quite different.

The purpose of this newsletter is to provide an update on PM size-selective sampling criteria and sampling devices for:

- Occupational sampling following ACGIH® criteria
- Environmental (ambient/indoor air) sampling following EPA criteria

**Look inside for information on:**

**Particulate Matters: Occupational**.....Pages 2-6  
Including updates on PM criteria and SKC sampling options for inhalable, thoracic, and respirable PM

**Particulate Matters: Environmental**.....Pages 7-9  
Including updates on PM criteria and SKC sampling options for PM10, PM2.5, and PM Coarse in ambient/indoor air

**PM Sampling: Sample Pumps**.....Pages 10-11  
Including the versatile AirChek XR5000 and the high-flow Leland Legacy Sample Pump

# PARTICULATE MATTERS OCCUPATIONAL

## Particulate Matters: Occupational

Traditionally, particulate measurements in the workplace have been performed using 37-mm filter cassettes for total dust with the addition of a cyclone for respirable dust. In the late 1980s, however, there was an international movement in the occupational hygiene profession to reconsider and redefine PM criteria and methods in the workplace for several reasons including:

1. Total dust had no defined size-range and total dust samplers had no defined performance criteria for the 50% (median) cut-point.
2. It was determined that so-called total dust samplers did not necessarily trap all airborne particulates breathed in by a worker throughout the normal workday. Specifically, they tended to undersample larger size particles.
3. The performance criteria, including the 50% cut-point for respirable dust samplers, varied throughout the world.

In the early 1990s, after considerable research and debate, the global occupational hygiene community came to consensus on new occupational size-selective sampling criteria for PM. ACGIH first published the new PM criteria in the TLV<sup>®</sup>s and BEI<sup>®</sup>s booklet in 1993. Particle Size-selective Sampling Criteria for Airborne Particulate Matter is found in Appendix C of the 2008 TLVs and BEIs booklet.






### ACGIH PM Criteria Defined

**Inhalable Particulate Matter (100- $\mu$ m 50% cut-point)** — replaces total dust and represents those materials that are hazardous when deposited anywhere in the respiratory tract.

**Thoracic Particulate Matter (10- $\mu$ m 50% cut-point)** — defines a unique size fraction not specifically covered in traditional occupational PM criteria. Thoracic particulates are those materials that are hazardous when deposited anywhere within the lung airways and the gas-exchange regions.

**Respirable Particulate Matter (4- $\mu$ m 50% cut-point)** — still represents particles that can penetrate to the alveolar region of the lung. However, the new criteria specifies a 50% cut-point for respirable dust samplers that represents a consensus of several global occupational hygiene organizations and standard-setting bodies.

See the following table for information on particle size-selective samplers available from SKC for occupational PM sampling.

Sampler	Classification	Flow Rate	50% Cut-point	Calibration Device	Filter Size	Cat. No.
 Button Sampler	Inhalable	4 L/min	100 $\mu$ m	Button Sampler Cal Adapter	25 mm	225-360
 IOM	Inhalable	2 L/min	100 $\mu$ m	IOM Cal Adapter	25 mm	225-70A
 GS-3 Cyclone	Respirable	3.7 L/min 2.75 L/min	3.5 $\mu$ m 4.0 $\mu$ m	Multi-purpose Cal Jar	25 or 37 mm	225-103 225-100
 SKC Aluminum Cyclone	Respirable	2.8 L/min 2.5 L/min	3.5 $\mu$ m 4.0 $\mu$ m	Aluminum Cyclone Cal Chamber	25 or 37 mm	225-01-01 225-01-02
 Parallel Particle Impactors (PPI)	Respirable or Thoracic	2 L/min 2 L/min	4 $\mu$ m 10 $\mu$ m	Multi-purpose Cal Jar	37-mm collection filter and 9.5-mm impaction substrates	225-380 225-381

# Occupational PM — Respirable SKC RESPIRABLE DUST CYCLONES

## GS-3 Respirable Cyclone

- **ACGIH/ISO/CEN respirable convention: 4- $\mu$ m 50% cut-point at a 2.75 L/min flow rate**
  - **Alternate applications:** 3.5- $\mu$ m 50% cut-point at a 3.7 L/min flow rate
- **Conductive plastic is safe for underground mine use**
  - Eliminates electrostatic effects
- **Tangential inlets lessen sampling errors due to particle impaction on cyclone wall**
- **Multiple inlet design overcomes problems reported with the Dorr-Oliver cyclone**
  - Eliminates ambient wind speed and orientation effects

The lightweight 10-mm GS-3 Cyclone is used with a standard three-piece cassette with filter for the collection of respirable-size particulate. The GS-3 Cyclone features a removable cassette adapter that fits securely into the middle ring of the filter cassette during sampling. Tangential inlets help prevent particles from impacting on the cyclone wall opposite the inlet. The multiple-inlet design eliminates wind velocity and orientation effects.

Description		Cat. No.
<b>GS-3 Cyclone</b> with bowl adapter, cassette adapter, and grit pot	37 mm	225-100
	25 mm	225-103
<b>Accessories</b>		
Filter Cassette/Cyclone Holder		225-1
Multi-purpose Calibration Jar		225-111

See [www.skinc.com](http://www.skinc.com) for more information.

## SKC Aluminum Respirable Cyclone

- **ACGIH/ISO/CEN respirable criteria: 4- $\mu$ m 50% cut-point at a 2.5 L/min flow rate**
  - **Alternate applications:** 3.5- $\mu$ m 50% cut-point at a 2.8 L/min flow rate
- **Conductive aluminum eliminates electrostatic effects**
- **Specified in NIOSH Method 7500 for silica and NIOSH 0600 for respirable particulates**
- **Using an open-face 3-piece cassette provides more even particle deposition on the filter**
  - Available in 25 or 37 mm
  - Insert into middle ring
- **Small and lightweight**
  - 2.6 x 1.5 inches (6.6 x 3.8 cm)

Available in 25 or 37 mm, the SKC Aluminum Cyclone provides sharp size selection of the respirable fraction at a 50% cut-point of 4  $\mu$ m. The cyclone's easy-to-use calibration chamber fits both 25 and 37-mm cyclones and provides for easy calibration.

Description		Cat. No.
<b>Aluminum Cyclone<sup>∞</sup></b> with grit pot	25 mm	225-01-01 <sup>∞</sup>
	37 mm	225-01-02 <sup>∞</sup>
<b>Accessories</b>		
Filter Cassette Holder, 25/37 mm		225-1
Calibration Chamber, 25/37 mm		225-01-03

<sup>∞</sup> Three-piece cassettes are required for use with SKC Aluminum Cyclones.

See [www.skinc.com](http://www.skinc.com) for more information.



Sample Time	Varies
Sample Rate	2.75 L/min for 4- $\mu$ m cut-point* 3.7 L/min for 3.5- $\mu$ m cut-point†
Sample Pump	Universal XR or AirChek Series
Sample Media	25 or 37-mm filters in 3-piece cassettes
Tubing	1/4-inch ID

For filters, visit [www.skinc.com](http://www.skinc.com)



Sample Time	Varies
Sample Rate	2.5 L/min for 4- $\mu$ m cut-point* 2.8 L/min for 3.5- $\mu$ m cut-point†
Sample Pump	Universal XR or AirChek Series
Sample Media	25 or 37-mm filters in 3-piece cassettes
Tubing	1/4-inch ID

For filters, visit [www.skinc.com](http://www.skinc.com)

\* Calibrated at U.K. Health and Safety Laboratory; visit [www.skinc.com/prod/225-100.asp](http://www.skinc.com/prod/225-100.asp) to view the collection efficiency curve

† Determined using experimental data obtained at flows from 2.0 to 4.0 L/min

# Occupational PM — Inhalable SKC BUTTON AEROSOL SAMPLER



- 4 L/min flow rate enhances sensitivity
- Closely follows the ACGIH/ISO sampling criteria for inhalable particulate mass
- Low sensitivity to wind direction and velocity
- Reduces electrostatic effects
- Minimally affected by orientation
- Small and lightweight
- Autoclavable
- Reduces oversampling of very large particles
- Suitable for collecting bioaerosols for viable or non-viable analysis
- Ideal for personal and area sampling

Sample Time	Varies
Sample Rate	4 L/min optimum
Sample Pump	AirChek XR5000, see p. 10
Sample Media	25-mm filters
Tubing	1/4-inch ID

The patented\* reusable SKC Button Aerosol Sampler features a porous curved-surface inlet that improves the collection characteristics of inhalable particulate (< 100- $\mu$ m aerodynamic diameter). The proximity of the filter to the inlet minimizes transmission losses and provides equal distribution of particle loading and low intersample variation.

Description	Cat. No.
<b>Button Sampler</b> , requires a 25-mm filter; see below	225-360
<b>Button Sampler Pump Kit</b> includes Button Sampler, standard XR5000 Sample Pump, single charger, 3 feet of Tygon® tubing, and calibration adapter, requires a 25-mm filter; see below	100-240 V 224-4121
<b>Abrasive Blasting Kit</b> includes Button Sampler and protective shield, requires a 25-mm filter; see below	225-367
<b>Accessories</b>	
<b>Protective Shield</b> , for abrasive blasting environments	225-366
<b>Button Sampler Calibration Adapter</b>	225-361
<b>Filter Transport Case</b> , for 25-mm filters, conductive plastic	225-67

\* U.S. Patent Nos. 5,954,845 and 5,958,111

## Recommended 25-mm Filters for Button Sampler

The Button Sampler requires a 25-mm filter for sampling. Pore sizes greater than 1 micron are recommended to lower back pressure and enhance sample time with personal sample pumps. Select the filter type from the list below that meets your application.

Description	Cat. No.
<b>PVC</b> , 5.0 $\mu$ m, 25-mm	225-8-04
<b>Glass Fiber</b> , 25-mm	225-702
<b>MCE</b> , 1.2 $\mu$ m, 25-mm	225-1912
<b>PTFE†</b> , 3.0 $\mu$ m, 25-mm	225-1711
<b>Gelatin</b> , sterilized, 25-mm	225-9551

† Back pressure on PTFE filters can vary within the same lot.

# Occupational PM — Inhalable SKC IOM SAMPLER

## Meets U.S. and international standards

- ACGIH sampling criteria for inhalable particulate
- ISO/CEN health-related fractions of bioaerosols
- Preferred sampler for HSE Method MDHS 14/3
- NIOSH Method 5700 for particulate formaldehyde
- Australian standard for inhalable particulate
- OSHA equivalent method for particulates not otherwise regulated (PNOR)<sup>‡</sup>  
‡ Reference: OSHA letter November 8, 2011

## Efficient particulate sampling up to 100 µm

## Improved plastic material significantly reduces effects of moisture

## Small and lightweight

- Plastic model weighs less than 2 ounces (55 grams)

## Maintains sample integrity

- Removable 25-mm cassette system eliminates filter handling
- Cassette and filter are weighed as a single unit to include all collected particles in analysis

## Stainless steel cassette available for chemical analysis

The patented\* IOM Personal Inhalable Sampler houses a reusable 25-mm filter cassette that holds a specified filter for the collection of inhalable particles. When attached to a personal sample pump operating at 2 L/min and clipped near a worker's breathing zone, the IOM effectively traps particles up to 100 µm in aerodynamic diameter. This collection method closely simulates the manner in which airborne workplace particles are inhaled through the nose and mouth. Both the cassette and the filter are pre and post-weighed as a single unit to include all collected particles in analysis. Alternatively, chemical analysis can be done on the filter loaded into a stainless steel cassette.



Sample Time	Varies
Sample Rate	2 L/min
Sample Pump	Universal XR or AirChek Series
Sample Media	25-mm filters <sup>†</sup>
Tubing	1/4-inch ID

Description	Cat. No.
IOM Sampler and cassette <sup>†</sup> , in conductive plastic, with transport clip and cover	225-70A
IOM Sampler and cassette <sup>†</sup> , in stainless steel, with transport clip and cover	225-76A
IOM Sampler <sup>†</sup> , in conductive plastic, with stainless steel cassette, transport clip, and cover	225-79A

## Accessories

Description	Cat. No.
Cassette assembly, in conductive plastic, with transport clip and cover	225-71A
Cassette assembly, in stainless steel, with transport clip and cover	225-75A
Transport Clip and Cover	225-72A
IOM Calibration Adapter	391-01

\* U.S. Patent No. 4,675,034

† A 25-mm filter is required for sampling with the IOM; see below.

## 25-mm Filters for IOM Sampler

The IOM Sampler requires a 25-mm filter for sampling. Select the filter type from the list below that meets your application.

Description	Cat. No.
PVC, 5.0 µm, 25-mm	225-8-04
Glass Fiber, 25-mm	225-702
MCE, 0.8 µm, 25-mm	225-1930
Polycarbonate, 0.8 µm, 25-mm	225-1601
Gelatin, 25-mm	225-9551

# Occupational PM — Thoracic SKC PARALLEL PARTICLE IMPACTORS

- Collection efficiency precisely matches thoracic PM criteria
- Economical and reusable
  - Use any suitable 37-mm filter
- Use with a sample pump at 2 L/min
- Disposable pre-oiled impaction substrates reduce particle bounce and buildup effects on sampling accuracy
  - Sampling efficiency is not dependent on collected particle type
- Only 3.3 ounces — ideal for personal or area sampling
- Thoracic model (10- $\mu$ m cut-point) is ideal for NIOSH Method 5524 and compounds with ACGIH thoracic TLVs
- Respirable models (4- $\mu$ m cut-point) are available for 2 L/min or 8 L/min flows

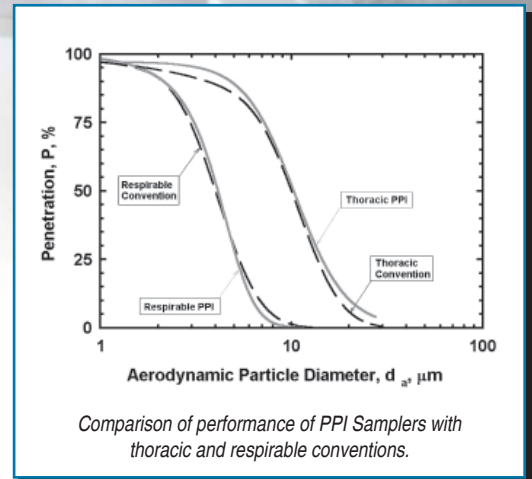


## The PPI 4 in 1 Advantage

Only the patented\* SKC Parallel Particle Impactor (PPI) has the power of 4 impactors in 1 small sampler to provide the closest match to the ACGIH/ISO/CEN thoracic or respirable conventions. A job no single personal impactor can do alone!

## Reduce Particle Buildup/Bounce Effects

Disposable pre-oiled porous plastic impaction substrates reduce the negative effects particle buildup and bounce can have on sample accuracy by firmly trapping larger particles. Unlike other samplers, SKC PPI sampling efficiency is not dependent on collected particle type.



Sample Rate	2 or 8 L/min
Sample Pump	Universal XR or AirChek Series; Leland Legacy for 8 L/min
Sample Media	37-mm filter (requires support and impaction substrates)
Tubing	1/4-inch ID

## PPI — What You Need

Select the PPI for the desired convention, choose a filter and support appropriate for your application, and order impaction substrates. Calibration, transport, and storage accessories are available as separate items.

Parallel Particle Impactors (PPI)	Cat. No.
Thoracic PPI (blue), 2 L/min, aluminum, requires substrates, filters, and supports	225-381
Respirable PPI (black), 2 L/min, aluminum, requires substrates, filters, and supports	225-380
Respirable PPI (red), 8 L/min, aluminum, requires substrates, filters, and supports	225-383
Recommended Collection Filters for PPI, required for sampling, select application-appropriate filter	
PVC Filters, 37 mm, 5.0- $\mu$ m pore size	225-8-01-1
PTFE Filters <sup>‡</sup> , 37 mm, 2.0- $\mu$ m pore size for metalworking fluids (NIOSH 5524)	225-27-07
MCE Filters, 37 mm, 0.8- $\mu$ m pore size	225-5
Filter Supports, required for sampling; select either cellulose or stainless steel	
Support Pads, cellulose, 37 mm	225-27
Support Screen, stainless steel, 37 mm, wide mesh	225-26
Impaction Substrates, 4 required for each sample	
Porous Plastic Discs <sup>†</sup> , 3/8-inch diameter, pre-oiled, ready to use, disposable	225-388 <sup>†</sup>
Accessories	
Multi-purpose Calibration Jar	225-111
Filter-Keeper, for transporting and storing 37-mm filter samples	225-8303A

\* U.S. Patent No. 7,073,402

† Limited shelf-life

‡ Back pressure on PTFE filters can vary within the same lot.



**Thoracic Particulate Mass**  
(10- $\mu$ m 50% cut-point), hazardous when deposited anywhere in the lung airways and the gas exchange regions

# Particulate Matters: Environmental

Historically, environmental professionals measured ambient PM using the criteria of total suspended particulates (TSP). In the 1980s, however, U.S. EPA determined the need for size-selective sampling of ambient PM to better assess potential health effects. By 1997, U.S. EPA had published criteria for ambient PM as PM 10 and PM 2.5. These criteria are commonly referred to as coarse and fine particulate, respectively. PM10 and PM2.5 have been used by environmental professionals to assess levels of PM not only in ambient air, but also in indoor air.

In May 1999, a legal challenge to the EPA PM10 criteria resulted in a Washington D.C. appellate court deciding that PM10 was a poor indicator of coarse PM because it includes fine PM. Based on this court decision, a new size fraction of PM Coarse has emerged and is being considered by EPA. The PM Coarse fraction represents PM10 minus PM2.5.

At this time, the U.S. EPA has not officially adopted PM Coarse at the federal level. EPA has retained PM10 as the indicator of coarse particles in the last review of the National Ambient Air Quality Standards (NAAQS). A new Federal Reference Method (FRM) for coarse particles based on PM10-2.5 has been finalized and EPA is encouraging development of candidate equivalent methods for PM10-2.5. A requirement for PM10-2.5 mass monitoring has also been instituted at the new NCore multi-pollutant monitoring stations.



## EPA PM Criteria Defined

**PM10** — Airborne particles with an aerodynamic diameter smaller than 10 microns

**PM2.5** — Airborne particles with an aerodynamic diameter smaller than 2.5 microns

**PM Coarse** — PM10 minus PM2.5

See the following table for information on particle size-selective samplers available from SKC for environmental PM sampling. Note that these SKC samplers are small, portable samplers designed for saturation studies. They are not U.S. EPA reference methods.

Sampler	Classification	Flow Rate	50% Cut-point	Calibration Device	Filter Size	Cat. No.
 <p>IMPACT Single-stage Impactor</p>	<b>PM2.5</b>	10 L/min	2.5 µm	IMPACT Cal Adapter	47-mm collection filter and	<b>225-392</b> <b>225-390</b> <b>225-3911</b>
	<b>PM10</b>	10 L/min	10 µm		37-mm impaction substrate	
	<b>PM Coarse</b>	10 L/min	10 µm, 2.5 µm			
 <p>Personal Modular Impactor (PMI)</p>	<b>PM2.5</b>	3 L/min	2.5 µm	PMI Cal Adapter	37-mm collection filter and	<b>225-352</b> <b>225-350</b> <b>225-351</b>
	<b>PM10</b>	3 L/min	10 µm		25-mm impaction substrate	
	<b>PM Coarse</b>	3 L/min	10 µm, 2.5 µm			

# PARTICULATE MATTERS ENVIRONMENTAL

# Environmental PM — Ambient/Indoor PM SKC IMPACT SAMPLER

- ▶ **Sharp size-selection for PM10, PM2.5, or PM Coarse** <sup>(10-2.5)</sup>
  - Ideal for environmental PM sampling and indoor air studies
- ▶ **Use with any constant flow pump at 10 L/min — Leland Legacy recommended**
- ▶ **Compact design**
- ▶ **Higher flow rate provides increased sensitivity**
- ▶ **Convenient operation**
  - Removable filter cassette for fast media changes
  - Disposable ready-to-use pre-oiled impaction disks reduce particle bounce — no cleaning or greasing
  - Included rain cover protects sampler during outdoor use
  - Optional quick-mount bracket secures sampler virtually anywhere



## IMPACT and the Leland Legacy Sample Pump

While IMPACT can be used with any pump at 10 L/min, partnering IMPACT with the Leland Legacy pump provides a highly efficient sampling system. The quiet, fully programmable Leland Legacy pump can provide a constant 10 L/min flow rate for 24 hours making it ideal for environmental monitoring or indoor air studies. *IMPACT and the Leland Legacy Sample Pump are both included in the DPS Sampling System. See [www.skcinc.com](http://www.skcinc.com) for more information.*

The patented<sup>‡</sup> SKC IMPACT single-stage inertial impactor is designed for the efficient collection of PM10, PM2.5, or PM Coarse <sup>(10-2.5)</sup> in ambient air. A sampling pump operating at 10 L/min draws PM through the impactor; larger particles are captured on a disposable pre-oiled impaction disc while smaller particles collect on a 47-mm filter. IMPACT media changes are as easy as removing the filter cassette and replacing it with one already loaded with a filter and impaction disc. The impaction disc fits into the top of the cassette. IMPACT's higher flow rate requirement provides increased sensitivity to low levels of PM. For sampling efficiency data, go to [www.skcinc.com/instructions/Modular\\_Impactors\\_Poster.pdf](http://www.skcinc.com/instructions/Modular_Impactors_Poster.pdf).

Sample Time	Varies
Sample Rate	10 L/min
Sample Pump	Leland Legacy, see p. 11
Sample Media	47-mm filters (requires impaction substrate)
Tubing	3/8-inch ID

IMPACT Sampler	Cat. No.
<b>IMPACT Sampler</b> includes filter cassette, calibration adapter, and rain cover for sampler; requires collection media and impaction substrate sold separately; see below	
<b>PM2.5</b>	225-392
<b>PM10</b>	225-390
<b>PM Coarse</b> includes 2 filter cassettes	225-3911
<b>Recommended Collection Filters</b>	
<b>Quartz Filters</b> , 47 mm, Tissuquartz, 432 µm thick	225-1823
<b>PTFE Filters</b> <sup>§</sup> , 47 mm, 2.0-µm pore size, with PMP support ring	225-1747
<b>Accessories</b>	
<b>Impaction Discs</b> , 37 mm, pre-oiled, ready to use, disposable, required for sampling. Limited shelf-life	225-395 225-395A
<b>PM Coarse Ring</b> includes filter cassette, adapts IMPACT PM10 to an IMPACT PM Coarse	225-3912
<b>Petri Dish Slide</b> , for filter transport	225-2-01
<b>Replacement Filter Cassette</b>	225-396
<b>Filter Cassette Opener</b>	225-397
<b>Mounting Bracket</b>	225-399

<sup>‡</sup> U.S. Patent No. 7,334,453

<sup>§</sup> Back pressure on PTFE filters can vary within the same lot.



The IMPACT Sampler is the heart of the DPS System for PM10 or PM2.5.

For more information, see [www.skcinc.com](http://www.skcinc.com)

# Environmental PM — Personal/Micro-environmental SKC PERSONAL MODULAR IMPACTOR (PMI)

- **Models available for PM10, PM2.5, or PM Coarse (10-2.5) sampling**
- **Use with any constant flow pump at 3 L/min**
- **Compact and lightweight — only 2.5 ounces (71 grams)!**
  - Ideal for personal sampling
  - Closely follows PM2.5 or PM10 as defined by EPA
- **Convenient modular design for easy operation**
  - Removable filter cassette for easy media changes
  - Disposable ready-to-use pre-oiled impaction substrates reduce particle bounce for high collection efficiency — no cleaning or greasing
  - Convenient clip for mounting sampler in the breathing zone
- **PMI 10 sampler is easily converted to measure PM Coarse with accessory ring**
- **PMI 10 sampler is suitable for ACGIH® thoracic TLV®s**
  - Including sulfuric acid and cotton dust as thoracic particulate matter

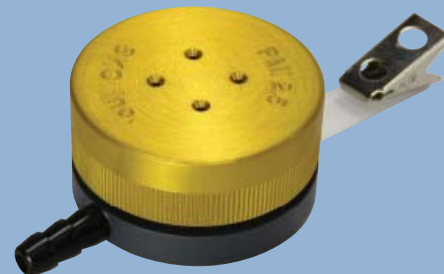
The patented\* SKC single-stage Personal Modular Impactors (PMIs) are designed for the highly efficient collection of PM10, PM2.5, or PM Coarse (10-2.5). The samplers are easy to use with a removable filter cassette and pre-oiled impaction disc. PMI media changes are as easy as removing the filter cassette and replacing it with one already loaded with a 37-mm filter. The 25-mm pre-oiled impaction disc mounts directly on top of the filter cassette and reduces particle bounce for high collection efficiency. A 25-mm non-coated filter may be used as an alternate impaction substrate for optional chemical analysis of particles. The PMI Coarse model includes a second filter cassette to allow collection of particles less than 10 µm, but larger than 2.5 µm.

PMI Sampler	Cat. No.
<b>Personal Modular Impactor (PMI)</b> includes impactor and filter cassette with support screen, requires collection media and impaction substrate sold separately; see below	
<b>PM2.5</b>	225-352
<b>PM10</b>	225-350
<b>PM Coarse</b> includes 2 filter cassettes and filter retainer	225-351
<b>Recommended Collection Media</b>	
<b>Quartz Filters</b> , 37 mm, Tissuquartz, 432 µm thick	225-1822
<b>PTFE Filters†</b> , 37 mm, 2.0-µm pore size, with PMP support ring	225-1709
<b>PTFE Filters†</b> , 37 mm, 1.0-µm pore size, with laminated PTFE support	225-2705
<b>Recommended Impaction Substrate</b>	
<b>Pre-oiled Porous Plastic Discs‡</b> , 25 mm, ready to use, disposable, required for sampling. Limited shelf-life	225-355 225-355A
<b>Accessories</b>	
<b>PM Coarse Ring</b> includes filter cassette, adapts a PMI 10 to a PMI Coarse	225-3512
<b>Replacement Filter Cassette</b>	225-356
<b>PMI Cassette Opener</b>	225-357
<b>Forceps</b> , stainless steel, non-serrated flat tips	225-8371
<b>Filter-Keepers</b> , 37 mm, for filter transport	225-8303 225-8303A
<b>PMI Calibration Adapter</b>	225-358
<b>Filter Retainer</b> , secures filter in impaction substrate position on top of cassette	225-354

\* U.S. Patent No. 7,334,453

† Back pressure on PTFE filters can vary within the same lot.

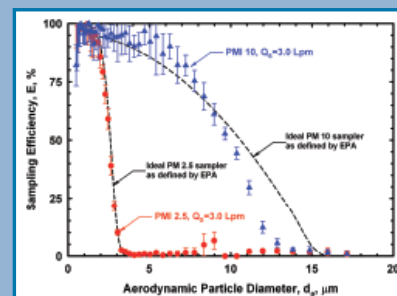
‡ A 25-mm non-coated filter may be used as an alternative impaction substrate for chemical analysis.



Sample Time	Varies
Sample Rate	3 L/min
Sample Pump	Universal XR or AirChek Series
Sample Media	37-mm filter (requires impaction substrate)
Tubing	1/4-inch ID

## PMI Performance

The graph below demonstrates the high sampling efficiency of the PMI PM2.5 and PM10 Samplers when compared to the EPA PM2.5 and PM10 criteria curves. For more information, see the Modular Impactor Poster Presentation at [www.skinc.com/instructions/Modular\\_Impactors\\_Poster.pdf](http://www.skinc.com/instructions/Modular_Impactors_Poster.pdf).



## Recommended Pump for PMI



*AirChek XR5000 Sample Pump, see page 10*

# PM Sampling — Sample Pumps

## SKC AIRCHEK XR5000 SAMPLE PUMP



**AirChek XR5000**

Partner with cyclones, Button Sampler, IOM, PPI, or PMI. See pages 3 to 6 and 9.

- ▶ **Extended flow range: 5 to 5000 ml/min<sup>†</sup>**
  - Suitable for low flow gas/vapor or high flow particulate sampling
  - Optional low flow tube holder<sup>‡</sup> used with a CPC allows up to four tube samples to be taken simultaneously, each at different flow rates if desired
- ▶ **Extended back pressure capabilities**
  - Up to 50 inches of water at 2 L/min
- ▶ **3 interchangeable battery options**
  - High-power Li-Ion for extended runs
  - Standard Li-Ion for lighter weight
  - Disposable AA alkaline batteries for fast emergency response
- ▶ **Highly accurate electronic flow control system<sup>†</sup>**
  - Compensates with  $\pm 5\%$  accuracy
- ▶ **Extremely simple operation**
  - Easy-to-use three-button keypad
  - Continuous run with the push of a button
  - Bright blue pump status LED
  - Easy-to-read LCD displays elapsed time and accumulated run time
- ▶ **UL Listed for intrinsic safety (Li-Ion models only)**
- ▶ **Automatic flow correction for changes in temperature provides accurate air volumes**
- ▶ **Set-and-go timer**
  - Timed and delayed runs up to 9999 minutes
- ▶ **Sample Integrity**
  - Lockable keypad
  - Automatic flow fault
  - Auto-restart attempted after 15 seconds in flow fault
- ▶ **Standard model weighs only 16 ounces (454 grams)**

### Enhanced Battery Power, Extended Run Times

XR5000 Model	2 L/min*	5 L/min*
High-power Li-Ion	40 hrs	22 hrs
Standard Li-Ion	20 hrs	11 hrs
Alkaline	18 hrs	8 hrs

\* Results of run time tests using 37-mm, 0.8- $\mu$ m MCE filters with new pumps and batteries. Pump and battery performance may vary.

AirChek® XR5000 with High-power Li-Ion Battery**	Cat. No.
<b>Pump with battery</b> and screwdriver set, <i>requires charger, see kits or chargers below</i>	210-5001
<b>Single Pump Kit</b> includes pump, charger, cassette holder, and soft-side nylon carry case <b>100-240 V</b>	210-5001K
<b>5-pack High Flow Pump Kit</b> includes 5 pumps and cassette holders and Take Charge 5 Multi-charger, in a Pelican case <b>100-240 V</b>	210-5001K5
AirChek XR5000 with Standard Li-Ion**	
<b>Pump with battery</b> and screwdriver set, <i>requires charger, see kits or chargers below</i>	210-5002
<b>Single Pump Kit</b> includes pump, charger, cassette holder, and soft-side nylon carry case <b>100-240 V</b>	210-5002K
<b>5-pack High Flow Pump Kit</b> includes 5 pumps and cassette holders and Take Charge 5 Multi-charger, in a Pelican case <b>100-240 V</b>	210-5002K5
AirChek XR5000 with Alkaline — Not Intrinsically safe	
<b>Pump with 6 AA batteries</b> and screwdriver set	210-5003
<b>5-pack High Flow Pump Kit</b> includes 5 pumps and cassette holders, in a Pelican case	210-5003K5
Accessories	
<b>Single Charger</b> for high-power and standard Li-Ion pumps <b>100-240 V</b>	223-241
<b>Take Charge 5 Multi-charger</b> , 5-station, for high-power and standard Li-Ion pumps <b>100-240 V</b>	223-441

\*\* AirChek XR5000 pumps with Li-Ion batteries may be subject to special shipping regulations.

<sup>†</sup> 5 to 500 ml/min with Low Flow Adapter Kit

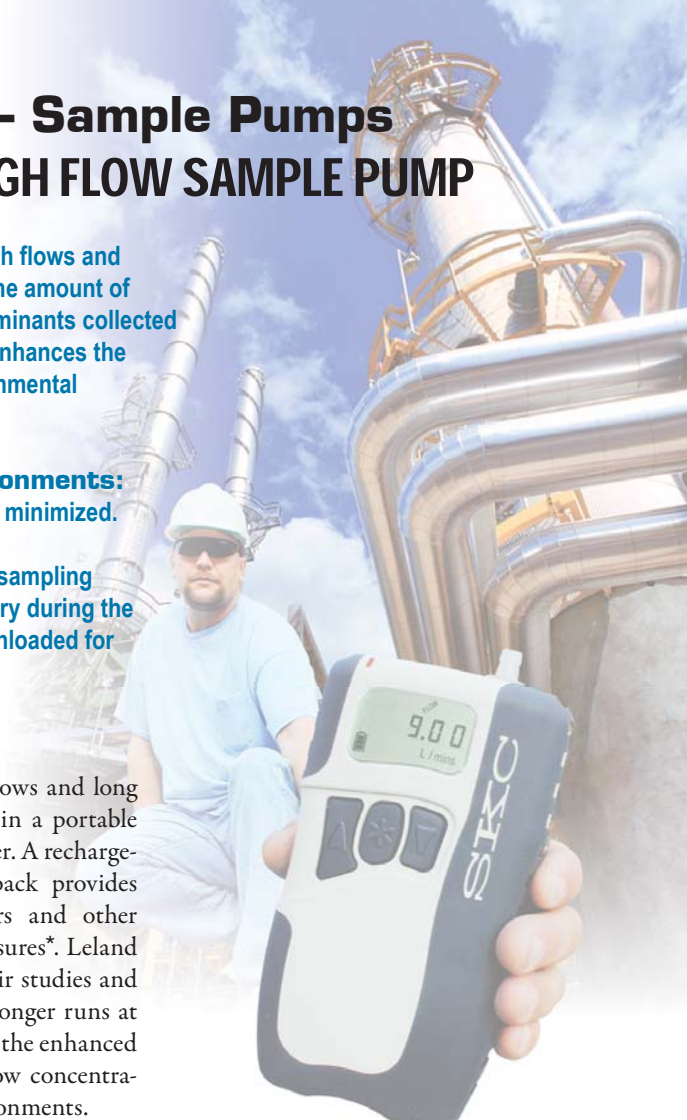
<sup>‡</sup> U.S. Patent No. 5,892,160

# PM Sampling — Sample Pumps

## LELAND LEGACY HIGH FLOW SAMPLE PUMP

- **Collects more sample:** High flows and long run times greatly increase the amount of particulate matter or other contaminants collected when sampling low levels. This enhances the usefulness of the data for environmental health studies.
- **Designed for indoor environments:** Pump noise, size, and weight are minimized.
- **Downloadable history:** All sampling parameters are retained in memory during the sampling period and can be downloaded for record keeping.

Leland Legacy® provides the high flows and long run times of a vacuum-style pump in a portable personal-size battery-operated sampler. A rechargeable lithium-ion (Li-Ion) battery pack provides 24-hour run times with impactors and other sampling devices with low back pressures\*. Leland Legacy is ideal for 24-hour indoor air studies and unattended ambient air sampling. Longer runs at higher flows provide more sample for the enhanced sensitivity required for measuring low concentrations, particularly in indoor air environments.



**Leland Legacy**  
Partner with the IMPACT Sampler.  
See page 9.

Description		Cat. No.
<b>Leland Legacy Pump</b> ** with Li-Ion battery pack and screwdriver set, requires charger, see kits or charger below		100-3002
<b>Single Pump Kit</b> ** includes Leland Legacy Pump, single charger, in a Pelican carry case	100-240 V	100-3002K
<b>5-pack Pump Kit</b> ** includes 5 Leland Legacy Pumps, 5-pump charging station, and DataTrac Software, in a Pelican case	100-240 V	100-3002K5
<b>Single CalChek Kit</b> ** includes items in a single pump kit, a CalChek Communication cable, and a Defender calibrator with charger	100-240 V	100-3002DFK
<b>5-pack CalChek Kit</b> ** includes items in 5-pack pump kit, a CalChek Communication cable, and a Defender calibrator with charger	100-240 V	100-3002DFK5
<b>Accessories</b>		
<b>Single Charger</b> #, for Li-Ion battery powered pumps	100-240 V	223-241
<b>Take Charge 5 Multi-charger</b> #, 5-station, for Li-Ion battery powered pumps	100-240 V	223-441
<b>Battery Charging Adapter</b> , for charging batteries outside the pump		223-248
<b>CalChek Communication Cable</b> , required for CalChek calibration, available separately or in CalChek Kits		210-502
<b>Noise-reducing Case</b> , black nylon, reduces pump noise from 62.5 dB to 52 dB <sup>Δ</sup>		224-89
<b>DataTrac Software for Leland Legacy</b>		877-92

\* Leland Legacy is not recommended for high back pressure applications such as asbestos clearance sampling.  
 # Use in non-explosive environments only. Not UL Listed for intrinsic safety  
 \*\* Leland Legacy pumps contain Li-Ion batteries and may be subject to special shipping regulations.  
 Δ Measured 1 meter from pump operating at 10 L/min without media

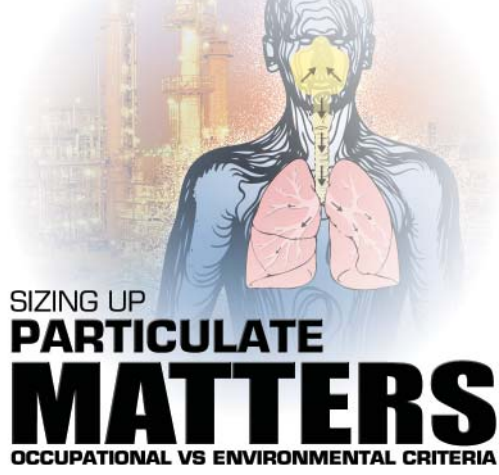


Leland Legacy is the power of the DPS System for PM10 or PM2.5.

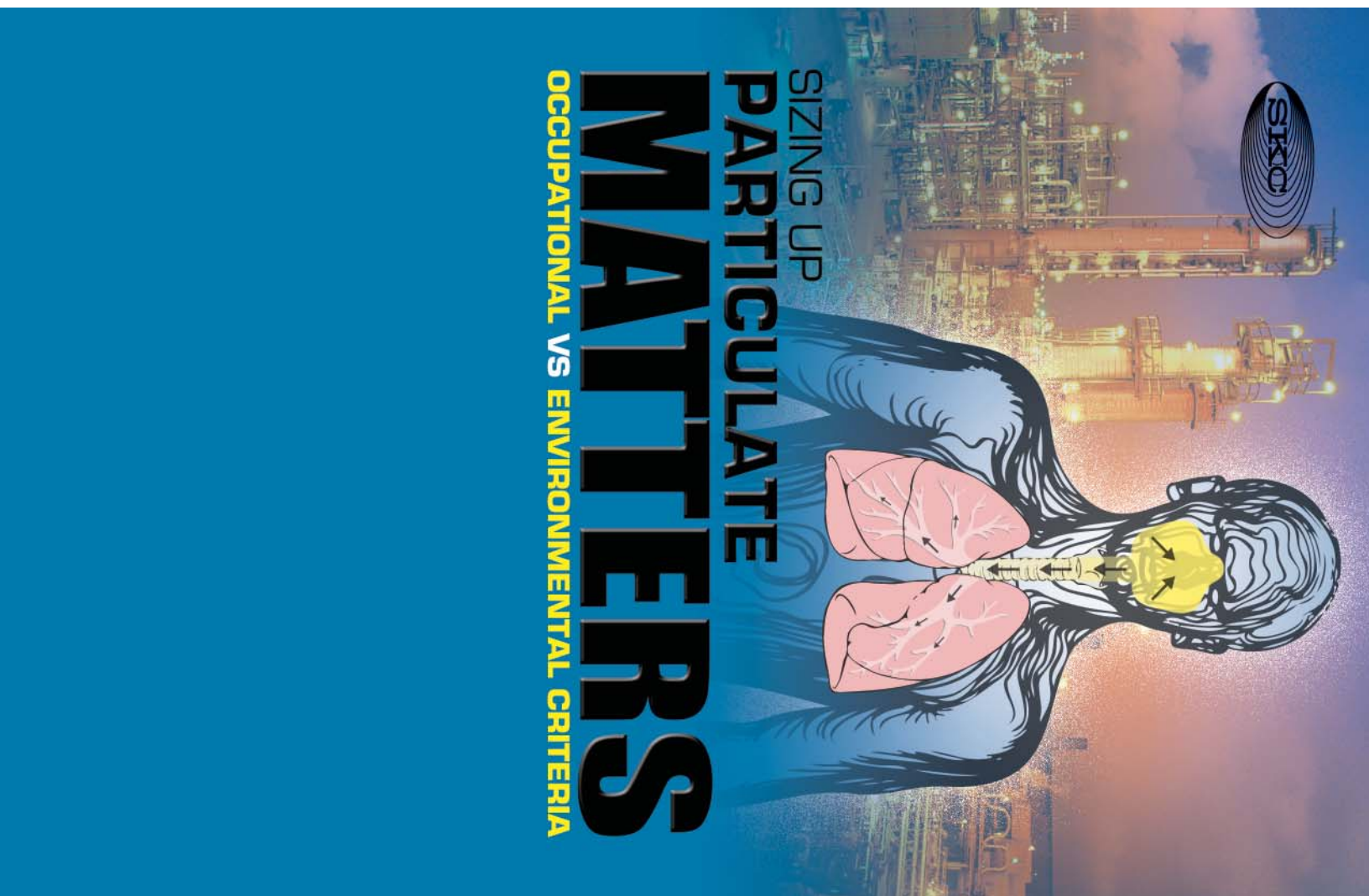
For more information, see [www.skinc.com](http://www.skinc.com).

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